

SEQUENCE LISTING

<110> Dlawer, Ala' Aldeen
Todd, Ian

<120> SCREENING FOR NEISSERIAL VACCINE CANDIDATES AND
VACCINES AGAINST PATHOGENIC NEISSERIA

<130> 15-840

<140> US 09/743,674

<141> 2001-01-10

<150> PCT/GB99/02205

<151> 1999-07-09

<160> 4

<170> PatentIn version 3.1

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<212> DNA

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<222> (119)..(2761)

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Tyr Ile Leu Lys Asn Asn Arg Gln Ile Lys Leu Ile Ala Ala Ser Val
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gca gtt gcc gca tcc ttt cag gca cat gct gga ctg ggc gga ctg aat 310
 Ala Val Ala Ala Ser Phe Gln Ala His Ala Gly Leu Gly Gly Leu Asn
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atc cag tcc aac ctt gac gaa ccc ttt tcc ggc agc att acc gta acc 358
 Ile Gln Ser Asn Leu Asp Glu Pro Phe Ser Gly Ser Ile Thr Val Thr
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ggc gaa gaa gcc aaa gcc ctg cta ggc ggc ggc agc gtt acc gtt tcc 406
 Gly Glu Glu Ala Lys Ala Leu Leu Gly Gly Gly Ser Val Thr Val Ser
 85 90 95

gaa aaa ggc ctg acc gcc aaa gtc cac aag ttg ggc gac aaa gcc gtc 454
 Glu Lys Gly Leu Thr Ala Lys Val His Lys Leu Gly Asp Lys Ala Val
 100 105 110

att gcc gtt tct tcc gaa cag gca gtc cgc gat ccc gtc ctg gta ttc 502
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 Arg Ile Gly Ala Gly Ala Gln Val Arg Glu Tyr Thr Ala Ile Leu Asp
 130 135 140

cct gtc ggc tac tcg ccc aaa acc aaa tct gca ctt tca gac ggc aag 598
 Pro Val Gly Tyr Ser Pro Lys Thr Lys Ser Ala Leu Ser Asp Gly Lys
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 Thr His Arg Lys Thr Ala Pro Thr Ala Glu Ser Gln Glu Asn Gln Asn
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gcc aaa gcc ctc cgc aaa acc gat aaa aaa gac agc gcg aac gca gcc 694
 Ala Lys Ala Leu Arg Lys Thr Asp Lys Lys Asp Ser Ala Asn Ala Ala
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gtc aaa ccg gcg tac aac ggc aaa acc cat acc gtc cgc aaa ggc gaa 742
 Val Lys Pro Ala Tyr Asn Gly Lys Thr His Thr Val Arg Lys Gly Glu
 195 200 205

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Thr Val Lys Gln Ile Ala Ala Ala Ile Arg Pro Lys His Leu Thr Leu
 210 215 220

gaa cag gtt gcc gat gcg ctg ctg aag gca aac cca aat gtt tcc gca 838
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 225 230 235 240

cac ggc aga ctg cgt gcg ggc agc gtg ctt cac att ccg aat ctg aac 886
 His Gly Arg Leu Arg Ala Gly Ser Val Leu His Ile Pro Asn Leu Asn
 245 250 255

agg atc aaa gcg gaa caa ccc aaa ccg caa acg gcg aaa ccc aaa gcc 934
 Arg Ile Lys Ala Glu Gln Pro Lys Pro Gln Thr Ala Lys Pro Lys Ala
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gaa acc gca tcc atg ccg tcc gaa ccg tcc aaa cag gca acg gta gag 982
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gcg gaa aaa ccg gcc gtt cga ccc gaa cct gta ccc gct gca aat act 1078
 Ala Glu Lys Pro Ala Val Arg Pro Glu Pro Val Pro Ala Ala Asn Thr
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 Ala Ala Ser Glu Thr Ala Ala Glu Ser Ala Pro Gln Glu Ala Ala Ala
 325 330 335

tct gcc atc gac acg ccg acc gac gaa acc ggt aac gcc gtt tcc gaa 1174
 Ser Ala Ile Asp Thr Pro Thr Asp Glu Thr Gly Asn Ala Val Ser Glu
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cct gtc gaa cag gtt tct gcc gaa gaa gaa acc gaa agc gga ctg ttc 1222
 Pro Val Glu Gln Val Ser Ala Glu Glu Glu Thr Glu Ser Gly Leu Phe
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ggc ggt tcg tac acc ttg ctg ctt gcc ggc gga ggc gcg gca ttg atc 1270
 Gly Gly Ser Tyr Thr Leu Leu Leu Ala Gly Gly Gly Ala Ala Leu Ile
 370 375 380

gcc ctg ctg ctg ctt ttg cgc ctt gcc caa tcc aaa cgc gcg cgc cgt 1318

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Asp Asp Gly Ile Glu Ile Thr Phe Ala Glu Val Glu Thr Pro Ala Thr
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ccc gaa ccc gct ccg aaa aac gat gta aac gac aca ctt gcc tta gat 1462
Pro Glu Pro Ala Pro Lys Asn Asp Val Asn Asp Thr Leu Ala Leu Asp
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Gly Glu Ser Glu Glu Glu Leu Ser Ala Lys Gln Thr Phe Asp Val Glu
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Thr Asp Thr Pro Ser Asn Arg Ile Asp Leu Asp Phe Asp Ser Leu Ala
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gcc gcg caa aac ggc att tta tcc ggc gca ctt acg cag gat gaa gaa 1606
Ala Ala Gln Asn Gly Ile Leu Ser Gly Ala Leu Thr Gln Asp Glu Glu
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acc caa aaa cgc gcg gat gcc gat tgg aac gcc atc gaa tcc aca gac 1654
Thr Gln Lys Arg Ala Asp Ala Asp Trp Asn Ala Ile Glu Ser Thr Asp
500 505 510

agc gtg tac gag ccc gag acc ttc aac ccg tac aac cct gtc gaa atc 1702
Ser Val Tyr Glu Pro Glu Thr Phe Asn Pro Tyr Asn Pro Val Glu Ile
515 520 525

gtc atc gac acg ccc gaa ccg gaa tct gtc gcc caa act gcc gaa aac 1750
Val Ile Asp Thr Pro Glu Pro Glu Ser Val Ala Gln Thr Ala Glu Asn
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Lys Pro Glu Thr Val Asp Thr Asp Phe Ser Asp Asn Leu Pro Ser Asn
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ctg aaa gtg tac gaa acc gat gcc gtc gcg gaa act gcg cct gaa acg 1990
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ccc gat ttc aac gcc gcc gca gac gat ttg tcc gca ttg ctt caa cct 2038
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 625 630 635 640

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cct tct gaa gta cct gcc gtt gag gaa aat gca gcg gaa atc gtt gcc 2182
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 675 680 685

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 Asp Asp Leu Ser Ala Leu Leu Gln Pro Ala Glu Ala Pro Ala Val Glu
 690 695 700

gaa aat gta acg gaa act gtt gcc gaa acg tcc gac ttc cac acc gcc 2278
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gca gac gat ttg tcc gca ctg ttg caa cct gct gaa gta ccg gcc gtt 2326
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755 760 765

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Val Glu Glu Asn Ala Ala Glu Ile Thr Leu Glu Thr Pro Asp Ser Asn
770 775 780

acc tct gag gca gac gct ttg ccc gac ttc ctg aaa gac ggc gag gag 2518
Thr Ser Glu Ala Asp Ala Leu Pro Asp Phe Leu Lys Asp Gly Glu Glu
785 790 795 800

gaa acg gta gat tgg agc atc tac ctc tcg gaa gaa aat atc cca aat 2566
Glu Thr Val Asp Trp Ser Ile Tyr Leu Ser Glu Glu Asn Ile Pro Asn
805 810 815

aat gca gat acc agt ttc cct tcg gaa tct gta ggt tct gac gcg cct 2614
Asn Ala Asp Thr Ser Phe Pro Ser Glu Ser Val Gly Ser Asp Ala Pro
820 825 830

tcc gaa gcg aaa tac gac ctt gcc gaa atg tat ctc gaa atc ggc gac 2662
Ser Glu Ala Lys Tyr Asp Leu Ala Glu Met Tyr Leu Glu Ile Gly Asp
835 840 845

cgc gat gcc gct gcc gag aca gtg cag aaa ttg ctg gaa gaa gcg gaa 2710
Arg Asp Ala Ala Ala Glu Thr Val Gln Lys Leu Leu Glu Glu Ala Glu
850 855 860

ggc gac gta ctc aaa cgt gcc caa gca ttg gcg cag gaa ttg ggt att 2758
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<400> 2

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35 40 45

Ala Val Ala Ala Ser Phe Gln Ala His Ala Gly Leu Gly Gly Leu Asn
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Ile Gln Ser Asn Leu Asp Glu Pro Phe Ser Gly Ser Ile Thr Val Thr
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Gly Glu Glu Ala Lys Ala Leu Leu Gly Gly Gly Ser Val Thr Val Ser
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Glu Lys Gly Leu Thr Ala Lys Val His Lys Leu Gly Asp Lys Ala Val
100 105 110

Ile Ala Val Ser Ser Glu Gln Ala Val Arg Asp Pro Val Leu Val Phe
115 120 125

Arg Ile Gly Ala Gly Ala Gln Val Arg Glu Tyr Thr Ala Ile Leu Asp
130 135 140

Pro Val Gly Tyr Ser Pro Lys Thr Lys Ser Ala Leu Ser Asp Gly Lys
145 150 155 160

Thr His Arg Lys Thr Ala Pro Thr Ala Glu Ser Gln Glu Asn Gln Asn
165 170 175

Ala Lys Ala Leu Arg Lys Thr Asp Lys Lys Asp Ser Ala Asn Ala Ala
 180 185 190

Val Lys Pro Ala Tyr Asn Gly Lys Thr His Thr Val Arg Lys Gly Glu
 195 200 205

Thr Val Lys Gln Ile Ala Ala Ala Ile Arg Pro Lys His Leu Thr Leu
 210 215 220

Glu Gln Val Ala Asp Ala Leu Leu Lys Ala Asn Pro Asn Val Ser Ala
 225 230 235 240

His Gly Arg Leu Arg Ala Gly Ser Val Leu His Ile Pro Asn Leu Asn
 245 250 255

Arg Ile Lys Ala Glu Gln Pro Lys Pro Gln Thr Ala Lys Pro Lys Ala
 260 265 270

Glu Thr Ala Ser Met Pro Ser Glu Pro Ser Lys Gln Ala Thr Val Glu
 275 280 285

Lys-Pro-Val-Glu-Lys-Pro-Glu-Ala-Lys-Val-Ala-Ala-Pro-Glu-Ala-Lys
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Ala Glu Lys Pro Ala Val Arg Pro Glu Pro Val Pro Ala Ala Asn Thr
 305 310 315 320

Ala Ala Ser Glu Thr Ala Ala Glu Ser Ala Pro Gln Glu Ala Ala Ala
 325 330 335

Ser Ala Ile Asp Thr Pro Thr Asp Glu Thr Gly Asn Ala Val Ser Glu
 340 345 350

Pro Val Glu Gln Val Ser Ala Glu Glu Glu Thr Glu Ser Gly Leu Phe
355 360 365

Gly Gly Ser Tyr Thr Leu Leu Leu Ala Gly Gly Gly Ala Ala Leu Ile
370 375 380

Ala Leu Leu Leu Leu Leu Arg Leu Ala Gln Ser Lys Arg Ala Arg Arg
385 390 395 400

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Asp Asp Gly Ile Glu Ile Thr Phe Ala Glu Val Glu Thr Pro Ala Thr
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Thr Gln Lys Arg Ala Asp Ala Asp Trp Asn Ala Ile Glu Ser Thr Asp
500 505 510

Ser Val Tyr Glu Pro Glu Thr Phe Asn Pro Tyr Asn Pro Val Glu Ile
515 520 525

Val Ile Asp Thr Pro Glu Pro Glu Ser Val Ala Gln Thr Ala Glu Asn
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Lys Pro Glu Thr Val Asp Thr Asp Phe Ser Asp Asn Leu Pro Ser Asn
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Asn His Ile Gly Thr Glu Glu Thr Ala Ser Ala Lys Pro Ala Ser Pro
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Ser Gly Leu Ala Gly Phe Leu Lys Ala Ser Ser Pro Glu Thr Ile Leu
580 585 590

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Leu Lys Val Tyr Glu Thr Asp Ala Val Ala Glu Thr Ala Pro Glu Thr
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Pro Asp Phe Asn Ala Ala Ala Asp Asp Leu Ser Ala Leu Leu Gln Pro
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Pro Ser Glu Val Pro Ala Val Glu Glu Asn Ala Ala Glu Ile Val Ala
675 680 685

Asp Asp Leu Ser Ala Leu Leu Gln Pro Ala Glu Ala Pro Ala Val Glu
690 695 700

Glu Asn Val Thr Glu Thr Val Ala Glu Thr Ser Asp Phe His Thr Ala
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Ala Asp Asp Leu Ser Ala Leu Leu Gln Pro Ala Glu Val Pro Ala Val
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Glu Glu Asn Val Thr Lys Thr Val Ala Glu Ile Pro Asp Phe Asn Ala
740 745 750

Thr Ala Asp Asp Leu Ser Ala Leu Leu Gln Pro Ser Glu Val Pro Ala
755 760 765

Val Glu Glu Asn Ala Ala Glu Ile Thr Leu Glu Thr Pro Asp Ser Asn
770 775 780

Thr Ser Glu Ala Asp Ala Leu Pro Asp Phe Leu Lys Asp Gly Glu Glu
785 790 795 800

Glu Thr Val Asp Trp Ser Ile Tyr Leu Ser Glu Glu Asn Ile Pro Asn
805 810 815

Asn Ala Asp Thr Ser Phe Pro Ser Glu Ser Val Gly Ser Asp Ala Pro
820 825 830

Ser Glu Ala Lys Tyr Asp Leu Ala Glu Met Tyr Leu Glu Ile Gly Asp
835 840 845

Arg Asp Ala Ala Ala Glu Thr Val Gln Lys Leu Leu Glu Glu Ala Glu
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 Ile Ile Leu Cys Phe Ser Phe Phe Val Pro Lys Phe Ala Leu Ala Ser
 20 25 30

gta aat gtt ccg ggt aaa ttt gat agg gtt gaa gtt tat gat gat ggc 144
 Val Asn Val Pro Gly Lys Phe Asp Arg Val Glu Val Tyr Asp Asp Gly
 35 40 45

aga tat tta ggt att cga ggt tca gat gac aaa aga aga aga att tgg 192
 Arg Tyr Leu Gly Ile Arg Gly Ser Asp Asp Lys Arg Arg Arg Ile Trp
 50 55 60

aaa ggt gta ttt gat aga gaa tcg gga aga tat tta act tca gaa gct 240
 Lys Gly Val Phe Asp Arg Glu Ser Gly Arg Tyr Leu Thr Ser Glu Ala
 65 70 75 80

caa gat tta aaa gtt agg cat gta tct act gga gca tca agt acg ggt 288
 Gln Asp Leu Lys Val Arg His Val Ser Thr Gly Ala Ser Ser Thr Gly
 85 90 95

aaa gtt agt tcg gtt gta tct tca tca gtt tcc cgc gcc gga gtc ttg 336
 Lys Val Ser Ser Val Val Ser Ser Val Ser Arg Ala Gly Val Leu
 100 105 110

gca gga gtc gcc aaa ctt gcc cgc tta gcc gcg aaa tta agc aca agg 384
 Ala Gly Val Gly Lys Leu Ala Arg Leu Gly Ala Lys Leu Ser Thr Arg
 115 120 125

gca gtt cct tat gtc gga aca gcc ctt tta gcc cat gac gta tac gaa 432
 Ala Val Pro Tyr Val Gly Thr Ala Leu Leu Ala His Asp Val Tyr Glu
 130 135 140

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 145 150 155 160

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 Thr Asp Lys Phe Val Lys Gly Tyr Glu Tyr Ser Asn Cys Leu Trp Tyr
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gaa gac aaa aga cgt att aat aga acc tat ggc tgc tac ggc gtt gac 576
 Glu Asp Lys Arg Arg Ile Asn Arg Thr Tyr Gly Cys Tyr Gly Val Asp
 180 185 190

agt tcg att atg cgc ctt atg tcc gat gac agc aga ttc ccc gaa gtc 624
 Ser Ser Ile Met Arg Leu Met Ser Asp Asp Ser Arg Phe Pro Glu Val
 195 200 205

aaa gaa ttg atg gaa agc caa atg tat agg ctg gca cgt ccg ttt tgg 672
 Lys Glu Leu Met Glu Ser Gln Met Tyr Arg Leu Ala Arg Pro Phe Trp
 210 215 220

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 Asn Trp His Lys Glu Glu Leu Asn Lys Leu Ser Ser Leu Asp Trp Asn
 225 230 235 240

aat ttt gtt tta aat agt tgc aca ttt gat tgg aac ggc gga gat tgt 768
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 Val Val Asn Lys Gly Asp Asp Phe Arg Asn Gly Ala Asp Phe Ser Leu
 260 265 270

att cgc aat tca aaa tac aaa gaa gaa atg gat gcc aaa aag ctg gaa 864
 Ile Arg Asn Ser Lys Tyr Lys Glu Glu Met Asp Ala Lys Lys Leu Glu
 275 280 285

gag att tta tcg ttg aaa gtc gat gcc aat ccc gac aaa tac ata aag 912
 Glu Ile Leu Ser Leu Lys Val Asp Ala Asn Pro Asp Lys Tyr Ile Lys
 290 295 300

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 305 310 315 320

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 325 330 335

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 340 345 350

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 355 360 365

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 370 375 380

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 385 390 395 400

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 Glu Pro Asp Pro Asp Leu Asn Pro Asp Ala Asn Pro Asp Thr Asp Gly
 405 410 415

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 465 470 475 480

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Phe Gln Lys Ser Gly Ile Phe Gln Asp Ser Ala Gln Cys Pro Ala Pro
485 490 495

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500 505 510

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Ser Phe Glu Asn Ala Cys Thr Ile Ala Glu Arg Leu Arg Tyr Met Leu
515 520 525

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<213> Neisseria meningitidis

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Arg Tyr Leu Gly Ile Arg Gly Ser Asp Asp Lys Arg Arg Arg Ile Trp
50 55 60

Lys Gly Val Phe Asp Arg Glu Ser Gly Arg Tyr Leu Thr Ser Glu Ala
65 70 75 80

Gln Asp Leu Lys Val Arg His Val Ser Thr Gly Ala Ser Ser Thr Gly
85 90 95

Lys Val Ser Ser Val Val Ser Ser Ser Val Ser Arg Ala Gly Val Leu
100 105 110

Ala Gly Val Gly Lys Leu Ala Arg Leu Gly Ala Lys Leu Ser Thr Arg
115 120 125

Ala Val Pro Tyr Val Gly Thr Ala Leu Leu Ala His Asp Val Tyr Glu
130 135 140

Thr Phe Lys Glu Asp Ile Gln Ala Gln Gly Tyr Gln Tyr Asp Pro Glu
145 150 155 160

Thr Asp Lys Phe Val Lys Gly Tyr Glu Tyr Ser Asn Cys Leu Trp Tyr
165 170 175

Glu Asp Lys Arg Arg Ile Asn Arg Thr Tyr Gly Cys Tyr Gly Val Asp
180 185 190

Ser Ser Ile Met Arg Leu Met Ser Asp Asp Ser Arg Phe Pro Glu Val
195 200 205

Lys Glu Leu Met Glu Ser Gln Met Tyr Arg Leu Ala Arg Pro Phe Trp
210 215 220

Asn Trp His Lys Glu Glu Leu Asn Lys Leu Ser Ser Leu Asp Trp Asn
225 230 235 240

Asn Phe Val Leu Asn Ser Cys Thr Phe Asp Trp Asn Gly Gly Asp Cys
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Val Val Asn Lys Gly Asp Asp Phe Arg Asn Gly Ala Asp Phe Ser Leu
 260 265 270

Ile Arg Asn Ser Lys Tyr Lys Glu Glu Met Asp Ala Lys Lys Leu Glu
 275 280 285

Glu Ile Leu Ser Leu Lys Val Asp Ala Asn Pro Asp Lys Tyr Ile Lys
 290 295 300

Ala Thr Gly Tyr Pro Gly Tyr Ser Glu Lys Val Glu Val Ala Pro Gly
 305 310 315 320

Thr Lys Val Asn Met Gly Pro Val Thr Asp Arg Asn Gly Asn Pro Val
 325 330 335

Gln Val Val Ala Thr Phe Gly Arg Asp Ser Gln Gly Asn Thr Thr Val
 340 345 350

Asp Val Gln Val Ile Pro Arg Pro Asp Leu Thr Pro Gly Ser Ala Glu
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Ala Pro Asn Ala Gln Pro Leu Pro Glu Val Ser Pro Ala Glu Asn Pro
 370 375 380

Ala Asn Asn Pro Asn Pro Asn Glu Asn Pro Gly Thr Ser Pro Asn Pro
 385 390 395 400

Glu Pro Asp Pro Asp Leu Asn Pro Asp Ala Asn Pro Asp Thr Asp Gly
 405 410 415

Gln Pro Gly Thr Arg Pro Asp Ser Pro Ala Val Pro Gly Arg Thr Asn
420 425 430

Gly Arg Asp Gly Lys Asp Gly Lys Asp Gly Lys Asp Gly Gly Leu Leu
435 440 445

Cys Lys Phe Phe Pro Asp Ile Leu Ala Cys Asp Arg Leu Pro Glu Ser
450 455 460

Asn Pro Ala Glu Asp Leu Asn Leu Pro Ser Glu Thr Val Asn Val Glu
465 470 475 480

Phe Gln Lys Ser Gly Ile Phe Gln Asp Ser Ala Gln Cys Pro Ala Pro
485 490 495

Val Thr Phe Thr Val Thr Val Leu Asp Ser Ser Arg Gln Phe Ala Phe
500 505 510

Ser Phe Glu Asn Ala Cys Thr Ile Ala Glu Arg Leu Arg Tyr Met Leu
515 520 525

Leu Ala Leu Ala Trp Ala Val Ala Ala Phe Phe Cys Ile Arg Thr Val
530 535 540

Ser Arg Glu Val
545